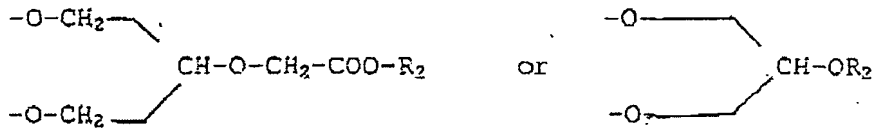
CLAIMS

1. A novel structure with macromolecules self-organized around nanotubes, characterized in that they are essentially formed from rings of polymerized lipid compounds surrounding the nanotubes, these polymerized compounds being obtained from lipid compounds comprising one or two chains A linked to a group Z:

- A representing a $CH_3-(CH_2)_m-C\equiv C-C\equiv C-(CH_2)_n-$ chain, n and m, which are the same or different, being integers from 1 to 16; and

- Z representing a polar head formed by a -COOH, $-CO-NH-Y$, $-NH_2$ or $N^+(R)_3$ group, R being a C_1 to C_4 alkyl and Y being a $-(CH_2)_4-C(R_1)-N(CH_2-COOH)_2$ radical, with R_1 representing H or a COOH radical if A represents a single lipid chain, or a group of the following structure:



where R_2 represents a -COOH or $-CO-NH-Y_1$ group, Y_1 being a $-(CH_2)_4-C(R_3)-N(CH_2-COOH)_2$ radical and where R_3 represents H or a COOH radical;
or Z or R_2 may also be hydrophilic or neutral polar heads of the sugar or polysaccharide type.
or Z or R_2 may also be hydrophilic or neutral polar heads, of the sugar or polysaccharide type.

2. The structures as claimed in claim 1, characterized in that the lipid compounds to be polymerized are amine lipids of formula:

$CH_3-(CH_2)_m-C\equiv C-C\equiv C-(CH_2)_n-NH_2$.

3. The structures as claimed in claim 1, characterized in that the lipid compounds to be

polymerized are quaternary ammoniums of formula:

$CH_3-(CH_2)_m-C\equiv C-C\equiv C-(CH_2)_n-N^+(R)_3$.

4. The structures as claimed in claim 1, characterized in that the lipid compounds to be polymerized are acid lipids with two chains A attached to Z.

5. The structures as claimed in any one of claims 2 to 4, characterized in that the lipid compounds to be polymerized are functionalized by a chelating group.

6. The structures as claimed in claim 1, characterized in that the lipid compounds to be polymerized are functionalized by a neutral hydrophilic head of the sugar or polysaccharide type.

7. A method of obtaining the structures as claimed in any one of claims 1 to 6, characterized in that it comprises the steps consisting in:

- bringing the raw nanotubes into contact with a solution of lipids so as to form a stable suspension;
- polymerizing the lipids, which are self-organized around the nanotubes; and
- recovering the nanotubes coated with rings formed by the polymerized lipids.

8. The method as claimed in claim 7, characterized in that the raw nanotubes are sonicated in a lipid solution in a buffered aqueous medium advantageously containing a detergent, the latter being subsequently removed by dialysis, and then the suspension of nanotubes in the aqueous buffer is subjected to a treatment for polymerizing the lipids.

9. A method of purifying nanotubes, characterized in that the structures as claimed in any one of claims 1 to 6 are subjected to a treatment so as to remove the rings of polymerized lipid compounds around the

nanotubes.

10. The method as claimed in claim 9, characterized in that said structures are subjected to size exclusion chromatography.

11. The method as claimed in claim 9, characterized in that an electric field is applied in order to remove the rings.

12. The method as claimed in claim 9, characterized in that said structures are heated in a Tris buffer at a temperature above 90°C for about 14 hours in order to remove the polymer and restore the stripped nanotubes.

13. Application of the structures as claimed in any one of claims 1 to 6 for protecting the nanotubes and, if required, for shortening these nanotubes in a controlled manner.

14. Application of the structures as claimed in any one of claims 1 to 6 as vectors for hydrophobic molecules or membrane proteins.

15. Application of the structures as claimed in any one of claims 1 to 6 as molecular motors.

16. Application of the structures as claimed in any one of claims 1 to 6 to the vectorization of products, especially in the pharmaceutical or cosmetic or perfumery field.